

# PATENT SPECIFICATION

1,075,114



1,075,114

Date of Application and filing Complete  
Specification: December 19, 1963, No. 50137/63

Application made in Japan (No. 14799) on March 19, 1963.

Complete Specification Published: July 12, 1967.

© Crown Copyright 1967.

Index at Acceptance:—D1 K (24A1O, 247, 251, 422, 454, 541, 55Y, 551, 558, 563, 564, 565, 66Y, 687, 688, 70Y, 703, 722, 724, 729); D1 S (4, 6, 10, 18); D1 W (7A, 7C).

Int. Cl.:—D 03 d, D 04 b // D01h, D06h.

## COMPLETE SPECIFICATION

### NO DRAWINGS

#### Method of Manufacturing Stretchable Knitted Goods and Woven Fabrics

We, KURASHIKI RAYON KABUSHIKI KAISHA of No. 1621, Sakazu, Kurashiki City, Japan, a company organized according to the laws of Japan, do hereby declare the invention,

5 for which we pray that a patent may be granted to us, and the method of which it is to be performed, to be particularly described in and by the following statements:—

The present invention relates to improvements in the method of manufacturing stretchable knitted goods and woven fabrics.

In manufacturing knitted goods and woven fabrics having good stretchable properties there is known a method by which yarns

15 having highly stretchable properties are set by means of a suitable setting agent, such as a paste, a knitwear of textile fabric is made by using such set threads, then the product is treated with a suitable treating agent to

20 remove the setting agent and to recover the original stretchability.

Such known methods, however, require skilled technique and the yarns are subjected to substantial tension and the inherent extensibility of the yarns is sacrificed so that it is difficult to develop satisfactory resilient knitted goods and woven fabrics.

According to the invention, water soluble 30 yarns of polyvinyl alcohol, and water insoluble, thermoplastic synthetic yarns are twisted together to provide mixed twisted yarns for knitting or weaving, and after making knitted goods or woven fabric with such mixed twisted yarns the product is caused to shrink in water or water vapour under conditions not to dissolve the water soluble yarns, then the fabric in this shrunken state is heat-set and afterwards the shrunken fabric is dipped into a solvent mainly consisting of water to dissolve and remove the water soluble yarns and to retain the insoluble yarns only.

The synthetic yarn insoluble in water and

[Price 4s. 6d.]

having thermoplasticity according to the invention may be a polyamide, polyolefine, 45 polyester, polyvinyl chloride, or a polyacrylonitrile.

The water soluble yarns are manufactured from polyvinyl alcohol and these yarns are soluble in warm water, hot water or hot 50 water under a high pressure. Polyvinyl alcohol yarns just after being spun, and also heat treated yarns, as well as partially saponified and completely saponified polyvinyl alcohol can be used, and the degree of 55 polymerization of the polyvinyl alcohol is preferably from 500 to 2,000.

The twisting of the water soluble yarns and water insoluble yarns according to the invention may be either clockwise or anti-clockwise and the twisting may be done in any desired manner, but so-called corkscrewed threads and spirally twisted threads, wherein the synthetic yarns are wound around a core of water soluble yarns are preferable. 60

Knitted goods or woven fabrics, made from the mixed twisted yarns, having large meshes are preferable as they are convenient for shrinking the knitted goods or woven fabrics in the later shrinking process. In this 70 case the sizes of meshes may be determined according to the extent of shrinkage. According to the invention, it is necessary to shrink the fabrics in water or water vapour; if crimp is given to the yarns by heat-setting 75 without shrinking, the knitted goods or woven fabric thus obtained shows only a small surface effect due to crimping, and a product having sufficient stretching properties as in the invention can never be obtained. 80 The extent of shrinkage is preferably 20 to 55%. At a shrinkage lower than 20%, products having sufficient shrinkage cannot be obtained to satisfy the object of the invention and at above 55% the soft texture is lost 85 and the process is uneconomical. The

BEST AVAILABLE CO.

shrinkage can be selected as desired within the range of 20 to 55% according to the strength, structure of the fabric and also the denier of the mixed twisted yarns. The heat-setting according to the invention can be carried out at a temperature and time in which the synthetic yarn to be used exhibits thermoplasticity, for instance, in the case of yarns of polyamides the temperature is 10 within 110 to 150°C, in the case of polyolefine yarns 90 to 130°C, and in the case of polyester yarns 160 to 200°C, for 1 minute in each case to firmly set the twisted form. Then the knitted goods and woven fabrics 15 thus completely heat-set are dipped into water to dissolve and remove the water soluble yarns and the temperature of the water in this case can be properly selected according to the nature of water soluble 20 yarns used.

For instance, the water-soluble yarns of polyvinyl alcohol immediately after being spun can be dissolved in cold water or warm water at a temperature lower than 60°C; for 25 yarns subjected to a slight heat treatment hot water under atmospheric pressure above 70°C may be used; for yarns subjected to further strong heat treatment hot water under pressure above 100°C may be used. 30 Further a small quantity of an agent for assisting the dissolution of water soluble yarn may be added to water without substantially weakening the thermoplastic synthetic yarn. As the auxiliary dissolving agent, 35 inorganic and organic acids and inorganic salts may be used.

By dissolving and removing the water soluble fibre yarns in this way there remain knitted or woven articles consisting of the 40 yarns of polyamides, polyolefines or polyesters. Such knitted goods and woven fabrics have desirable properties of stretching and softness, and are particularly well suited for making sporting wear in general and underwear for women.

When the woven fabrics are made by means of such mixed twisted yarns, they 50 may be used for either one or both of warp and weft. In the case of knitted goods, depending on the method of knitting, there is no reason why yarns other than the mixed twisted yarns of the invention shall not be involved. According to the invention, the shrinking and heat-setting should necessarily 55 be effected after the knitted goods and woven fabrics have been made from the mixed twisted yarns.

Then it is very easy to adjust the stretching of the products, and fabrics or 60 knitted goods having large stretching, which were impossible to obtain when the previously contracted and heat-set yarns are used, can easily be obtained.

*Example 1*

65 Multifilament yarns of polyvinyl alcohol

(15 denier) which is insoluble in warm water and soluble in hot water, heat treated at 225°C for 5 minutes, having an average degree of polymerization of 1,700 and a saponification degree of 88%, and nylon 70 multifilament yarn of 100 denier were twisted together for the S twist of 1,800 T/m. forming a mixed twisted yard and was twist-set in a reduced pressure steam boiler at 80°C for 20 minutes and said twisted yarns thus obtained were fed to a circular knitting machine having needle gauge of 21/inch. The fabric was successively dipped into warm water at 60°C for 30 minutes to treat the fabric uniformly in order to shrink the water soluble 80 yarns of polyvinyl alcohol to make knitted goods having smaller meshes. After centrifugal dehydration it was dried at a temperature of from room temperature up to 100°C for 30 minutes in a tumbler dryer without enlarging the size of the mesh, then further raised in temperature to 150°C for 10 minutes to heat-set, then quenched by introducing external air. The knit wear was dipped into hot water previously heated to 90°C and the water was agitated to dissolve and remove water soluble yarn of polyvinyl alcohol. Then after the water was replenished, the knit wear was dyed with acid dyestuff. The knitted goods thus dyed were dehydrated and dried 95 in a tumbler dryer at a temperature of increasing rate of from room temperature to 95°C for 30 minutes, then the dried knitted goods were subjected to the tenting finish by means of a tenter to provide soft knitted 100 goods having excellent stretch properties.

*Example 2*

Water soluble multifilament yarn of polyvinyl alcohol (45 denier) spun from the polyvinyl alcohol having average degree of 105 polymerization of 2,000 and degree of saponification of 98% by a conventional process and subjected to heat treatment at 220°C for 5 minutes and polyester yarn (210 denier) were twisted together to have S twist 110 of 1,500 T/m. forming mixed twisted yarn, then twistset in a reduced pressure steam boiler at 80°C for 20 minutes to provide weaving yarns. Said weaving yarns were woven to provide a fabric having "French Twill" weave structure of warp density 120/inch and weft density 60/inch and the fabric was successively dipped into warm water at 60°C and treated for 30 minutes uniformly to shrink in order to provide a fabric having compact meshes and the fabric was dehydrated by roller squeezing dehydrator, then dried in a dryer at 90°C for 4 minutes, and heat treated at 180°C for 1 minute. The fabric after heat treatment was washed in boiling water in a continuous tank to dissolve and remove the water soluble 115 yarns of polyvinyl alcohol and the remaining fabric was dehydrated and treated in a dryer at 90°C for 3 minutes, thus obtained soft 120 fabric having excellent stretch properties.

fabric having excellent stretch properties in warp and weft directions.

WHAT WE CLAIM IS:—

1. A method of manufacturing stretchable knitted goods or woven fabrics characterized by twisting together water soluble yarns of polyvinyl alcohol and other synthetic yarns insoluble in water but having thermoplasticity to provide mixed twisted yarns 10 which are knitted or woven to form a fabric, then shrinking the fabric in water or water vapour while not dissolving the water soluble yarns, and heat-setting the fabric in this shrunken state and afterwards dipping 15 the shrunken fabric into a solvent mainly consisting of water, thereby dissolving and removing the water soluble yarns.
2. A method according to claim 1 wherein the synthetic insoluble yarns are wound around a core of the soluble polyvinyl alcohol 20 yarns.
3. A method according to either of the preceding claims wherein the fabric is shrunk by 20 to 55%.
4. A method of manufacturing stretchable knitted goods or woven fabrics substantially as described herein by way of Example.
5. Knitted goods or woven fabric manufactured by a method according to any of the preceding claims. 30

MARKS & CLERK,  
Chartered Patent Agents,  
Agents for the Applicants.

Berwick-upon-Tweed: Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd.—1967  
Published at the Patent Office: 25 Southampton Buildings, London, W.C.2 from which copies may  
be obtained.

BEST AVAILABLE COPY

**THIS PAGE BLANK (USPTO)**